Why Tomography?

X-ray Tomography provides:

- **3D (&4/5D) information non-destructively, from across length and time scales, that can be correlated to other characterisation techniques (correlative tomography)**
- **Characterise the evolution of internal structure over time and in operando, feeding the results into models**

These novel insights impact on:

- **Science**
- **Industry**
- **Security**
- **Energy**
- **Health**
    - **I.e. A productive, resilient, connected and healthy nation**

Yesterday…

- Hounsfield (1972) invented the X-ray Computer scanner for medical work, and Cormack and Hounsfield were awarded a Nobel prize.

- At the same time the EMI scanner was announced, combining X-ray measurements and digital reconstruction algorithms
- Elliott and Dover (1981) used a scanning point source to perform the first “X-ray micro-tomography”
- UK is leading in many areas of tomography, from detectors to sources, and algorithms to applications

Today

- 2007 ~20 μCT systems in the UK, ~500 world-wide (Stock)
- Growth is exponential, now over 100 in UK
- Plus Diamond Light Source (I12, I13, I14, B24, etc..)
- Medical CT market is $4b/yr, expected to reach $12b by 2023

Courtesy Tristan Lowe

Tomorrow

Growth will be exponential:

- **Applications from materials science to archaeology**
- **Spatial (nm to cm) and temporal (ms-d) resolution**
- **Techniques**
  - **Correlative imaging**
  - **Multi-scale**
  - **Time resolved**
  - **Phase contrast**
  - **Synchrotron techniques**
  - **Colour imaging**
  - **Diffraction Contrast**
  - **Reconstruction**
  - **Image analysis / quantification**
- **Where should we focus our developments to remain world leading?**

Eastwood, Lee, Shearing, Grey

EPSRC X-ray Tomography Roadmap

Town Hall Meeting

Wed 12th December, University of Manchester

Dr Paul Shearing, UCL

p.shearing@ucl.ac.uk

What is a Roadmap?

- A ***community*** owned document
- One that can evolve and be re-visited
- A steer to funders regarding community need
- A mechanism for funders to target future infrastructure investment (mid range facilities etc)
- A tool for use in peer-review
- A review of the current landscape and a plan for the future

It is ***NOT***: the views of an individual, a case for (or guarantee of) future funding

The Steering Committee

Dr Paul Shearing, UCL - Chair of the steering committee

Dr Martin Turner, University of Manchester

Prof Ian Sinclair, University of Southampton

Prof Peter Lee, University of Manchester

Dr Farah Ahmed, Natural History Museum

Prof Andrew Harrison, Diamond Lightsource

Prof Richard Leach, University of Nottingham

Dr Wenjuan Sun, NPL

Dr Jay Warnett, University of Warwick

Prof Hugh McCann, University of Edinburgh

Dr Claire Higlett, EPSRC

The Scope

- Following extensive discussion this roadmap will focus ***only*** on X-ray tomography (and has been renamed to reflect this)
- Other modalities were considered (process, neutron, electrical, optical etc)
- Complementarities with these modalities may be identified in the roadmap but they will not form a substantive part of the exercise

Why?

- Risk of becoming too disperse
- Legacy of 'identifying a technique' and establishing steering group
- Notable similarities, but significant differences – particularly in hardware
- Maintain inclusivity and reach across discipline borders
- Empower and support other communities to conduct roadmap activities where appropriate

The Process

- Identifying a technique
- Identifying a lead author and working group
- *Information gathering*
- Feedback
- Key findings and recommendations

Information Gathering

1. Online survey
2. Follow up phone calls with facilities
3. Town Hall meetings (London, Manchester)
4. Report preparation
5. Expert readership *
6. Leading to….Launch of the roadmap

**** A small group of expert readers in the UK and internationally has been identified If you would like to nominate yourself or someone else, please let us know***

The Survey

- Building on previous surveys (Manchester, NPL)
- 143 respondents across disciplines and geographically disperse
- Owners of >50 instruments in the UK responded
- Identified technical landscape (hardware and software)
- Identified future challenges and opportunities

Follow Up

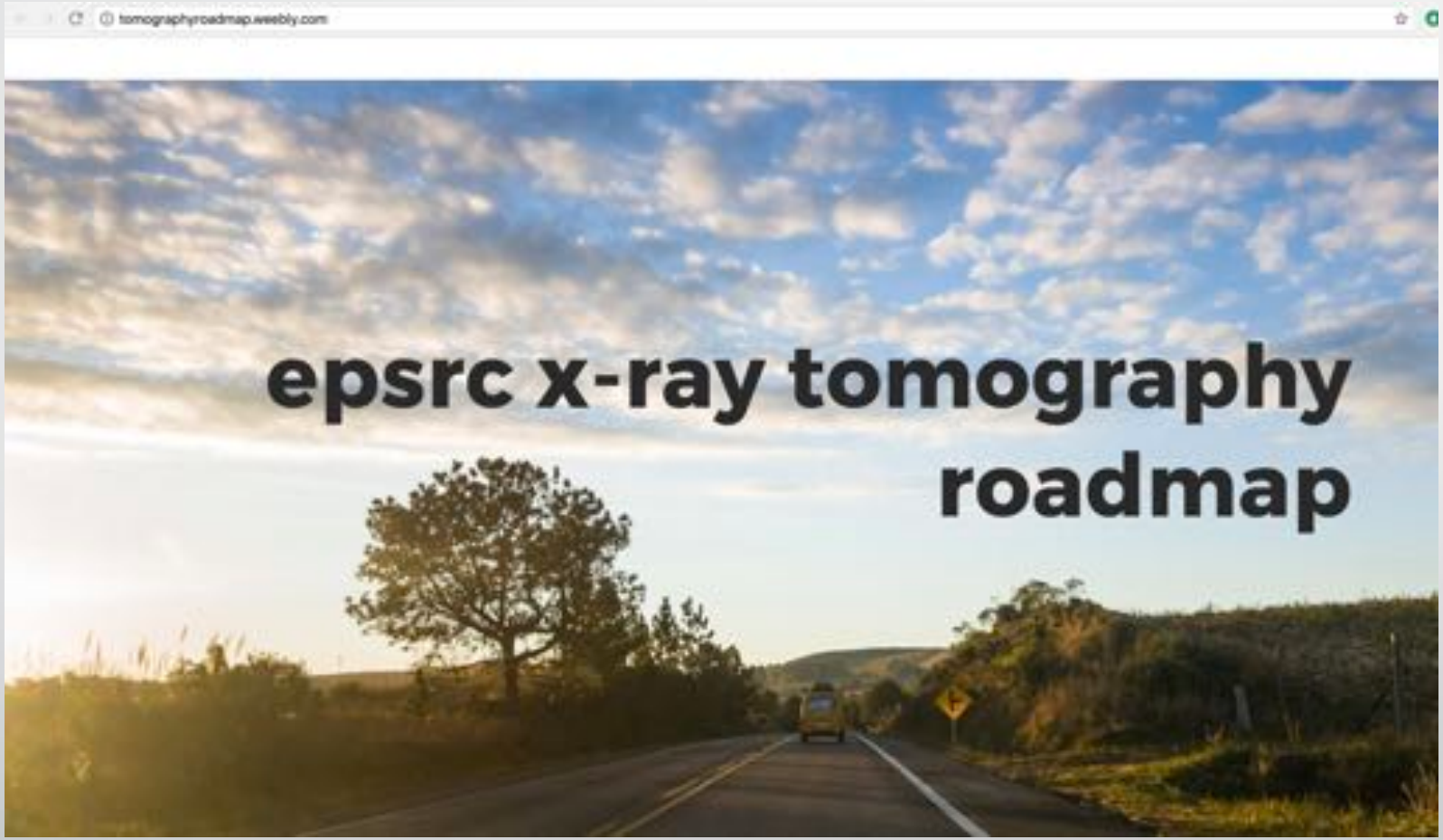
- Ca. 40 people agreed to be contacted for follow up
- Primarily those who manage/own instruments
- Follow up with these individuals is underway – usually one contact per university
- If you want to be contacted and have not been yet, **please let us know**

Topic 1: Clarify suite of instruments
Topic 2: Overview of usage (instrument availability, down time etc), and charging policy
Topic 3: Identify usage by discipline
Topic 4: Identify main academic users
Topic 5: Identify Industry Engagement
Topic 6: Identify Impact Case Studies and/or Science Highlights from centre research
Topic 7: What are you future needs (hardware, software, technique development)

Today

- Opportunity to present preliminary results
- Opportunity for you to engage with the process (please raise any concerns either publically or privately!)
- A key step in our information gathering
- A forum to discuss the current landscape and future needs of the community

Contact: p.shearing@ucl.ac.uk



Web: www.tomographyroadmap.weebly.com